

RESPONSE AND REQUEST FOR RECONSIDERATION

Support.

The lower limit of 2.5 percent for the condensation product (b-1) is found on page 8, line 3. The lower limit of 2.5 percent for the Mannich dispersant is found on page 9 at line 13. The lower limit for the total of all dispersants of 7.5% is found by adding the lower limits of 2.5% each for the condensation product and the Mannich dispersant, plus another 2.5% which may be supplied, for instance, by an optional additional dispersant (see page 9 line 19). The lower limit of 5% for the Mannich dispersant, in new claim 12, is also found on page 9, line 13. Here, alternative ranges of 0.5 to 8% and 2 to 5% are disclosed. Applicants have now selected the well-defined portion of the broad range that is at 5% and above.

Response.

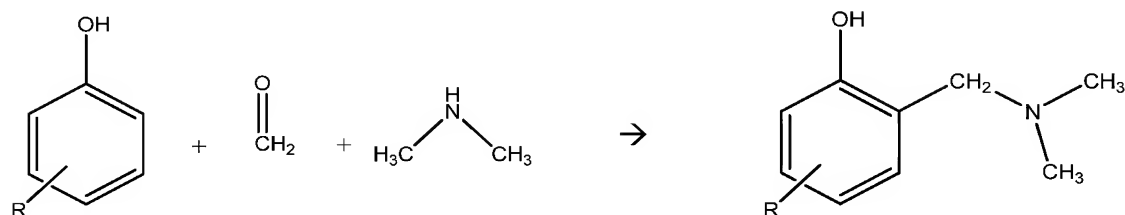
The present invention provides a lubricant composition which includes both the condensation product of a fatty hydrocarbyl monocarboxylic acylating agent with an amine or ammonia (e.g., the condensate of isostearic acid with tetraethylene pentamine) as well as a Mannich dispersant from polybutene-substituted phenol, formaldehyde, and ethylenediamine or dimethylamine. Also included is an aromatic amine antioxidant, oil, and optionally a combustible solvent (for ease of handling).

The Examiner has repeated his rejection of all claims as made obvious by Blythe in view of Chamberlin. Blythe discloses a two-cycle lubricant which includes at least one dispersant and at least one reaction product of a fatty acid and a polyamine. There is no disclosure of the use of an aromatic amine antioxidant. Among the several dispersants mentioned by Blythe are Mannich dispersants, although not the product from polybutene-substituted phenol, formaldehyde, and ethylenediamine or dimethylamine. Moreover, there is no example of the combination of any Mannich dispersant with the fatty acid/polyamine condensation product.

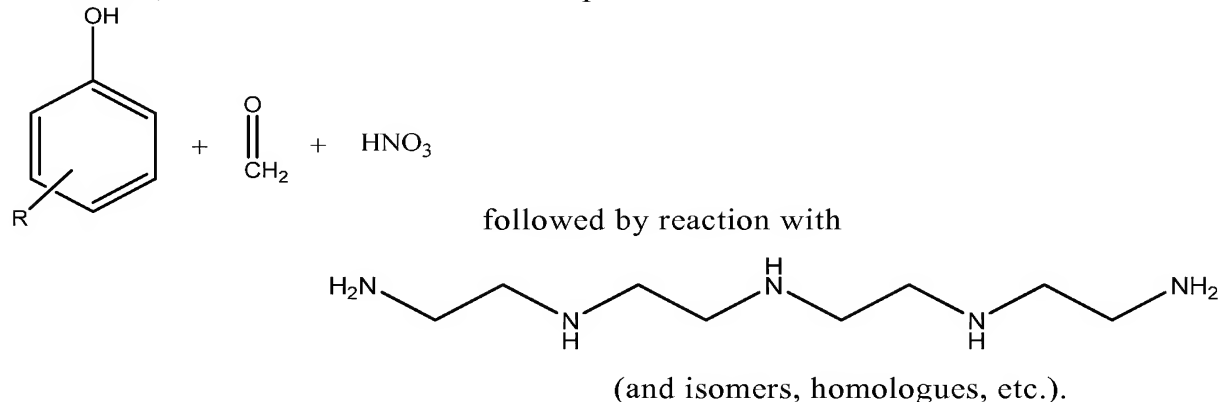
The Examiner had mentioned that Example B in Table 1 (col. 30) appeared to show the combination of a Mannich dispersant ("Example 8") and an isostearic acid/tetraethylene pentamine condensate (Example B2). This statement assumes that the material of "Example 8" (presumably Example A-8) is a Mannich dispersant, but this is not a credible or enabling source of a Mannich dispersant. The material of Example A-8 appears to be a material made from, among other things, some of the reactants that might lead to a Mannich dispersant. However, it is plainly could not be the claimed Mannich dispersant, for several reasons. First, it is not prepared from ethylenediamine or dimethylamine, as presently required, but rather from a polyethylene polyamine mixture. Secondly, the Declaration submitted herewith from Dr. Ewan Delbridge indicates that the procedure of A-8 was physically impossible to duplicate as

written. Finally, when the reaction mixture, duplicated as nearly as possible, was used in the formulations of the present invention, it did not provide acceptable results (Declaration of Dr. Patrick Mosier).

Mannich dispersants are well known in the lubricant industry and are prepared generally according to the following reaction:



In contrast, the reaction mixture of Example A-8 is



It is chemically unlikely that a nitro group resulting from the first part of the above reaction scheme would be reduced by the subsequent treatment with the polyamine and so form a Mannich product. This difference is in addition to the fact that the amine employed is different from what is required in the present claims.

Moreover, the data provided in the Declaration from Dr. Mosier indicates that the material from Blythe's example A-8 does not effectively provide the performance of either the Mannich dispersant or the fatty acid-amine condensation product, discussed in greater detail below.

The Examiner also objected that the data provided in the previous Declaration from Dr. Patrick Mosier was not commensurate with the scope of the claims in several particular. That is, (1) the examples all had 0% solvent; (2) the total amount of components (b-1) and (b-2) was only around 10%; and (3) only a single species of (b-1) condensate was examined. Each of these objection is addressed below, by way of

amendment, explanation, and/or additional data as presented in the new declaration from Dr. Mosier.

(1). The amount of solvent. Dr. Mosier explains, in his current Declaration, that it is well known in the field of two-cycle engine lubricants that lubricant compositions are typically mixed with a fuel such as gasoline and then delivered to the engine as the additive-fuel mixture. In the engine, the fuel evaporates and is eventually burned, leaving the less volatile or non-volatile lubricant components to lubricate the metal parts of the engine. The mixing of the lubricant formulation with the fuel typically occurs in the fuel tank, and in order to aid in this mixing, a low viscosity combustible solvent is often included with two-cycle lubricants. This solvent reduces the viscosity of the lubricant composition so that it will more readily mix with the fuel, and thereafter the combustible solvent becomes, in effect, a part of the fuel and is consumed along with the fuel. Thus, after the lubricant and solvent combination is mixed with the fuel, the combustible solvent no longer plays any role in the lubrication of the engine. The lubrication is effected by the oil and other additives.

For this reason, no solvent was included in the materials that have been tested for deposit performance. Indeed, the MHT TEOST test that is used to evaluate lubricants cannot tolerate the presence of volatile, combustible solvent. However, as indicated by Dr. Mosier, the test as performed without solvent provides a fair test of the lubricant performance, regardless of whether solvent is included in the formulation when it is actually used in a gasoline mixture in a 2-cycle engine.

The only effect that replacing some of the oil of lubricating viscosity with solvent will have, is to decrease the amount of oil in the formulation relative to the amount of other non-volatile additives. Example 2 in the newly submitted Declaration was designed to have a lower relative amount of oil, as would be typical if there were 40% volatile combustible solvent present. (The solvent was not physically present for the reasons discussed above; its “virtual” presence is indicated as “40% (virtual)”.) The results under these conditions also showed excellent deposit performance.

(2) Amounts of dispersants (b-1) and (b-2). Certain of the data in the Declaration of Dr. Mosier indicates that at very low concentrations of either the Mannich dispersant or of the condensation product, the deposit performance deteriorates. Thus, the claims have been amended to require that the amount of the Mannich dispersant is at least 2.5% (or 5% in claim 12) and the amount of the condensation product is at least 2.5% (all on an oil-free or active chemical basis). Also, if the amount of the aminic antioxidant is too low, the performance deteriorates. Hence the lower limit of aminic antioxidant has been increased to 0.8%. Thus it is submitted that the claims as amended exclude those examples for which the concentrations of either of the dispersants or the antioxidant were too low for effective functioning, and they include the

examples which did function well. Accordingly, it is believed that this aspect of the claims is now commensurate with the data that has been presented.

(3) Variety of species of (b-1). In this regard, the Examiner's attention is directed to claims 10 and 11, which specify that (b-1) is the condensation product of isostearic acid and a polyethylene polyamine (and specifically with tetraethylene pentamine in claim 11). This is commensurate with the particular material that was tested.

For the Examiner's convenience, the data in the Declarations of Dr. Mosier is summarized below. All amounts are presented on an oil-free basis except as noted. The results show that each of the claimed materials is necessary, within the claimed ranges, to achieve excellent deposit performance:

| | C1 | C2 | C3 | C4 | C5 | C6 | C7 | Ex1 | Ex2* | C8 | C9 | C10 | C11 |
|------------------------------|------|------|------|------|----|------|------|------|-------------|------|------|------|-------|
| Mineral oil ^a (a) | 83.7 | 92 | 92 | 84 | 89 | 88 | 83.7 | 87 | 47 | 91 | 90 | 92 | 88.25 |
| Cond'n prod (b-1) | 4.3 | | | | 5 | | 4.3 | 5 | 4.8 | 0.5 | 8 | 2 | 5 |
| Mannich dispt. (b-2) | | 7.04 | | | | 5.28 | 5.28 | 5.28 | 5.28 | 7.04 | 0.88 | 2.64 | 5.28 |
| Ex. A-8 | | | | | 6 | 6 | | | | | | | |
| Amino-phenol | 7.2 | | 4.8 | 9.6 | | | 3.6 | | | | | | |
| Solvent* (c) | | | | | | | | | 40* virtual | | | | |
| Amine AO (d) | | | | | | | | 2 | 2 | 0.5 | 1 | 2 | 0.75 |
| %N | 0.34 | – | – | – | – | – | 0.38 | 0.47 | – | – | – | – | – |
| MHT TEOST (mg total) | 57.4 | 88.4 | 76.3 | 39.4 | 37 | 36.1 | 28.2 | 7.3 | 0.3 | 59.6 | 31.2 | 50.5 | 43.8 |

* Ex2 was run with a reduced amount of mineral oil relative to the other components to simulate the presence of 40% volatile combustible solvent, which was not actually included, for the reasons discussed above. The amounts of components for this example, re-normalized to 100%, are (a) Mineral oil 78.7%; (b-1) Condensation product 8%; (b-2) Mannich dispersant 8.8%; (d) Diphenylamine antioxidant 3.3%.

a. plus small amount of diluent oil present in the Mannich dispersant (12%), and/or the aminophenol (40%), not included in the amount listed for those components.

The results show that for Examples 1 and 2, within the scope of the present claims, the deposit results in the MH TEOST test are excellent, having well under 28 mg total deposits. However, when the amounts of either or both the condensation product or the Mannich dispersant are too low (Comparative Examples 8, 9, or 10), the excellent results are not obtained. Likewise, when the amine antioxidant is omitted or is present at too low an amount (Comparative Examples 8 and 11), poor results are obtained, even though the dispersant components are present (Comparative Example 11) or even if the aminophenol material disclosed in Blythe is present (Comparative Example 7).

The complex mixture of Example A-8 of Blythe does not give good results when it replaces either the Mannich dispersant or the condensation product (Comparative Examples 5 and 6). Note that Comparative Example 5 is closely comparable with Example B of Blythe.

It is submitted that the claims, as amended (including new claim 12), are commensurate in scope with the examples that have demonstrated unexpectedly good performance.

Conclusion.

For the foregoing reasons it is submitted that the present claims are unobvious and in condition for allowance. The foregoing remarks are believed to be a full and complete response to the outstanding office action. Therefore an early and favorable reconsideration is respectfully requested. If the Examiner believes that only minor issues remain to be resolved, a telephone call to the Undersigned is suggested.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,

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